

LITERATURE REVIEW OF OPTIMIZATION TECHNIQUE BUSINESS: BASED ON CASE

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ABSTRACT

In today's complex business world, decision making plays a vital role in the success of any business. The simplex method, an operation research technique is widely used to finding solutions in many real world problems. This paper is an attempt to get an insight about the various application of optimization techniques in business. It is a conceptual research based on various literatures available. This study is based on different cases applied on selected sectors, viz., industrial, financial, resource allocation, agriculture, marketing and personnel management area.

Key words: Optimization Technique, Objective Function, Minimization, Maximization, Simplex Method, Business, Application.

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1. INTRODUCTION

Optimization technique is a mathematical approach to solve for the best solution to problem. It is a science designed to provide quantitative tools to help in decision making procedures. Optimization technique plays a vital role in operational as well as in strategic decision making in business. An application of optimization technique in business is used by the managers to determine the most economical arrangement of finance, to arrange the best times to start and finish projects, to select projects to minimize the total net present cost of capital, to determine the product mix that will maximize the total profit, and management based portfolio selection problems, etc. Linear programming being the most prominent optimization technique is applicable for the solution of real world problems in which the objective function and constraints appear as linear functions of the decision variables. It can be defined as a mathematical technique for determining the best optimal solution of a firm's limited resources to achieve best outcomes. The resources may be man, material, machine, land, etc. Most real

life problems when formulated as an LP model have more than two variables and therefore need a more efficient method to get optimal solution. In mathematical optimization, simplex method is most popular for linear programming to use get best outcomes. George B. Dantzig, who was a member of air force group, published the simplex method in 1947. After that many industries started using it and it has become a significant step in bringing LP into wider use. Its application arises in many different areas in real life. For example, someone wants to minimize the labor cost in a business or to maximize the profit of product. Or in an airline company wants to minimize the flight time of a plane or the fuel cost. Or in a hospital nurse allocation (A/c to patient care services) is done based on LPP. In simply words, either maximize or minimize the problems to get optimal results.

It is prominent techniques which are applicable in various fields. Now days, simplex method is efficient method that's why wider use in different –different sector to get a feasible result.

The number of application has been so large. This paper contributes to study of various application of optimization technique in business. Some significant applications of optimization techniques are selected from pervious literatures and discussed to get an insight, based on real world problems. A small number of such cases are discussed, based on application of optimization technique in real world problems.

2. LITERATURE REVIEW OF SIMPLEX METHOD

There are diverse opinions on application of simplex method to make decision in management in different sectors. These opinions developed by George Dantzig (American Mathematician) planned to solve the business problems and economic development after the World War II. During the world war he worked on planning methods for the US Air Force. Dantzig formulated linear inequalities inspired by Wassily Leontief. After that he planned for solving the industrial and business problems. Initially, Dantzig didn't include objectives in formulation so that huge number of feasible solution found, therefore more rules were required to choose a best solution among all feasible solution, In Mid 1947 Dantzig included objectives in his formulation. Afterwards, he developed a "Simplex Method" to solve linear programming problems. Simple method is a simple, elegant, yet powerful tool for solving linear programming problems. Simplex used to solve the major problems in many different fields like optimize maximum profit, minimize cost, agriculture, human resources and manufacturing decision making etc. Limited data required for calculate the result by using simplex method which is easily available. Today's most powerful simplex solver for excel is used. In 1993, solver engineering was created and since 1995 solver has been supplying and dealing with implementation of R3 management system of SAP company. This famous method for LP is used in standard Excel solver and developer of solver built into optimization and premium solver platform. This technology can handle up to 8,000 variables and 8,000 constraints and it is much faster and gives automatically best presolve strategy. Thousands of the companies are using simplex method and solver as in this review paper showed the different application in many areas. Most researcher such as Kurtz (1992), Taha (2008), Benedict.I.Ezema(2012) posit that the use of scientific methods, particularly linear programming in the allocation of scarce resources is play vital role to the manufacturing to boost the output.

3. OBJECTIVE OF STUDY

The objectives of the study are as below

1. To highlight various areas of business where optimization techniques are adopted.
2. To analyze the applicability of optimization techniques and the challenges faced by organizations based on cases discussed in related literatures.

3. APPLICATIONS OF OPTIMIZATION TECHNIQUE

Case 1

The first case is about the pragmatic use of optimization technique by manufacturing company "KASMO Industry Limited, Osogbo, Nigeria in 2010" to determine the product mix (combinations of sales packages). Linear Programming Technique was adopted by the company for optimizing packaging sizes of medicated soap which lead to optimal profit level. These four types of sales packages include 1 soap tablet per pack, 3 tablets per pack, 12 tablets per pack and 120 tablets per pack (sales in carton soap tablets). Five basic raw materials were used for the manufacturing KASMO medicated soaps. These raw materials were caustic soda, palm kernel oil, colourant, perfume and disinfectant. Required information's were available in the records of the company. The data collected from KASMO Industry Limited, Nigeria on her main product line –medicated soap. To determine the best sales packages that would yield maximum profit, the company considered various sizes of packaging considering the constraints of raw materials. This result helped to the management of KIL in the formulation of production and marketing strategies for their soap product to maximize the company profits. This technique helped in understanding the take right decision to maximize the profit.

Case 2

Linear programming is used in all fields, including agriculture. In agriculture, the farming structure of farms can be highly diversified to reduce risk and uncertainty related to unsealing the products. This paper mainly focused to determine the optimal structure of crops, taking into account the income and expenditure of crops per hectare and the objective was to carry out optimal results in terms of maximum production per hectare of land. Montazemi and wright (1982) applied mathematical programming approach in agriculture, using the some relevant resources like land resources, technical facilities etc. During this economic activity, the research question raised was whether after applying the econometric model the returns of the economic activity is higher or not. By changing the structure of crops, the profit from cultivation improved substantially and the profit of the farm maximized. The results showed that profit rose to 143% and costs reduced 81% according to the paper review.

Case 3

Another case is taken from the paper titled" LP applied to nurses shifting Problems", published at IJRS by (B. Satheeshkumar, 2014). In hospital, the main aim is to ensure continuous and adequate level ward care service with appropriate number of nurses with the right nursing skills to maintain the internal policies. A multi –specialty hospital in Coimbatore has been effectively used linear programming to solve the nurses scheduling problems and get optimal results. The scheduling is done by considering the constraints of nurse preferences such as the number of nights shift and consecutive rest days. Such Type of problem becomes the personal need of the nurses like vacation or work shift preference and other factors. Some the nurses might be trained to manage certain medical field or skilled, due to the varied

trainings and specializations of nurses has to be staffed forwards requiring those skills. Hospital must be staffed 24 hours a day by a limited number of nurses. Optimization technique by means of linear programming is an efficient tool to solve problems related to optimization in healthcare by utilized own appropriate resources. Now days, the ratio of the nurses available to patients in healthcare is very less. To increase the efficiency of services provided through nurses by using the optimization technique of LP with utilization of the minimum resources.

This technique helped in understanding the existing shifting problems in nursing as a whole and facilitated in making the right decision about requirement of the nursing staff at the different shift also can be extended to all the other field of work which relates to shift system.

To the efficiently balance the workload among people for satisfying personal preferences. The nutshell, to minimize changes to be original schedule while minimizing costs, rebuilding the schedule with current staffs usually be cheap option as there is no extra wage to pay, but altering the schedule will alter other nurses schedules as well.

Case 4

This case is taken from the research paper on “Optimal allocation of funds-CCML” by (Gyakwa Augustine, 2013). A micro finance bank “Christian Community Microfinance Limited “(CCML), Eastern zone, to allocate their funds to prospective loan seekers in order for them to maximize their profits. Simplex method of LP was used to solve the CCML problem by considering the constraints of different-different type loan, interest and limit of debts. In financial sector, due to poor allocation of funds by most financial institutions are not able to maximize their profits. The nutshell of the paper is about how Christian community microfinance limited has helped the community to allocate loans in order to optimize the profit margin. Most of the financial institutions in the country do not have used any scientific method for given out loans. Due to this, it is not able to optimize their maximum profits, which intern affects their socio economic contributions in the areas in which they operate. In a financial sector, many Nigeria financial institutions has been used operation technique in their allocation of funds to lead optimal profit level.

Case 5

This case is about the realistic (Benedict I. Ezema and Amakom, 2012) use of optimization technique in production firms “Golden plastic industry limited” Enugu, Nigeria, to determine the product mix (such sizes of PVC pipes produced). Linear programming technique was adopted by the company for optimizing production of different size of PVC pipes which to lead optimal level. Today's, many industries are continuously facing shortage of production inputs. Because of this there is a significant impact on outputs. Firms output depends upon management decision either minimize the resources or maximize the output. The optimal quantities of the different sized PVC pipes to be produced to get the maximum profit through company various sizes of dimension considering the constraints of product. In nutshell, optimization technique has helped to taken right decision and allocating scarce resources in such manner that will ensure profit maximization and cost minimization. The technique to solve problems relating to allocation of limited resources and uncertainty to different types of products, and it is better way to save cost and streamline the product mix. Most researchers such as Sargeant (1985), Kurtz(1992), Lucey (2000) and Taha (2008) posit that the use of scientific methods, particularly linear programming in the allocation of scarce resources is play vital role to the manufacturing to boost the output. The firms should adapt this technique to take right decision and get optimal result.

Case 6

The last case is the realistic (Gurhan Uysal, 2015, Simplex of HR) search for use of optimization technique in organization to the selection of best talents. This case is based on application of simplex technique used to choose the best talents an organization by human resources management. HRM plays important role in any firms. Contemporary human resource management may be defined with performance and talent management perspectives. Organization performance also depends on HRM decision. So chosen best talents, it is a big deal for human resource management (HRM) of any organization. As per paper review study was applied talent management in organizations to solve the problem using simplex method. Because talents increases business department's performance and performance of business departments increases organizational performance. So we can say that talents have an impact on company performance through individual performance and HRM are figure out and find out best talents from internal or external staffing sources for company performance. For example, HR finds production managers, stock managers, marketing managers and others. And HR and talent management are related with strategic human resource management. Simplex consider opposite alternatives to make management decision whereas opposite are internal source and external sources in his problem. During this decision maker consider limits in simplex's problem solving method to choose best candidate for firms. Basically researcher helped to HR for finding best talents. In nutshell, simplex method is also used in finding best candidates for organization performances. And also some of practical application problems like Portfolio selection and investment problems are based on financial management situation in which managers select specific investments form a variety of alternatives investment for example: stock, bonds etc. The main objectives of problem are to get expected return and minimize the risk by using operation technique.

4. CONCLUSION

There are numerous applications of Optimization techniques in various fields of business as well as in different sectors starting from Manufacturing, Automobiles, Service sector, Healthcare, or even in Agriculture. Though Linear programming problem started in Military field, its vast application in portfolio management, fund allocation, product mix, advertising mix or media mix, resource allocations and many other areas made it one of the most popular decision making tool. Our study has made an attempt to discuss few cases from existing literature. The above study has picked up different cases on application of optimization technique in business from different parts of the world, irrespective of its economic status, whether Nigeria or India or USA. It was observed that overwhelming number of real world problems are solved through using of optimization technique. Business whether small family business or large corporate should adopt optimization technique to enhance the decision making and to enhance efficiency and effectiveness of firm's performance and finally better decision will lead towards the profit maximization by using optimal resources.

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